



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,888	10/30/2003	Daniel R. Tretter	200314885-1	8499

22879 7590 10/31/2006

HEWLETT PACKARD COMPANY  
P O BOX 272400, 3404 E. HARMONY ROAD  
INTELLECTUAL PROPERTY ADMINISTRATION  
FORT COLLINS, CO 80527-2400

EXAMINER

KRASNIC, BERNARD

ART UNIT	PAPER NUMBER
----------	--------------

2621

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/696,888

**Applicant(s)**

TRETTER ET AL.

**Examiner**

Bernard Krasnic

**Art Unit**

2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> .                                  | 6) <input type="checkbox"/> Other: ____.                          |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :10-30-2003, 2-10-2004, 12-20-2004, 11-3-2005.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: reference number "800" in Fig. 11, reference number "1530" in Fig. 23.
2. The drawings are objected to because the sub-frame in Fig. 10 is referenced "301" instead of -- 30I -- as described by the specifications in page 19, line 1. Also in Fig. 11, the reference number "800" has not been described in the specifications.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

Art Unit: 2621

application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

3. The disclosure is objected to because of the following informalities:

Page 1, line 19, line 22: Application serial numbers should be filled out.

Page 30, line 6: "(i.e., 1.38)" should be -- (i.e., 1.63) --.

Appropriate correction is required.

### ***Claim Objections***

4. Claims 3, 5, 12, 14, 19, 21, 23, 24 are objected to because of the following informalities:

Claim 3, line 3: "a diamond grid" should be -- the diamond grid --.

Claim 5, line 3: "a rectangular grid" should be -- the rectangular grid --.

Claim 12, line 3: "a diamond grid" should be -- the diamond grid --.

Claim 14, line 3: "a rectangular grid" should be -- the rectangular grid --.

Claim 19, line 5: "between sub-frame values and high" should be -- between the low resolution sub-frame values and the high --.

Art Unit: 2621

Claim 19, line 8: "function of the sub-frame values" should be -- function of the low resolution sub-frame values --.

Claim 19, line 10-11: "each low resolution sub-frame generated" should be -- each of the low resolution sub-frames generated --.

Claim 21, line 2-3: "plurality of sub-frames each" should be -- plurality of low resolution sub-frames each --.

Claim 21, line 3: "on a diamond grid" should be -- on the diamond grid --.

Claim 23, line 2-3: "plurality of sub-frames each" should be -- plurality of low resolution sub-frames each --.

Claim 23, line 3: "on a rectangular grid" should be -- on the rectangular grid --.

Claim 24, line 1: "the simulated image" should be -- the simulated high resolution image --.

Claim 24, line 2: "plurality of sub-frames" should be -- plurality of low resolution sub-frames --.

Appropriate correction is required.

***Claim Rejections - 35 USC § 101***

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Art Unit: 2621

6. Claims 19-30 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 19 is an apparatus claim respectively. Because the limitations “means for receiving a first high resolution image”, “means for storing a relationship”, and “means for generating a first plurality of low resolution sub-frames” invoke the sixth paragraph of 35 USC 112, the equivalent for these means plus function should be determined in light of the specification. The claim is limited to the disclosed structure and its equivalents. Because software, per se, cannot perform the claimed functionality (i.e., without a computer), this claim can only be properly construed as being directed towards a computer programmed with the disclosed software (or any disclosed hardware equivalents), or any equivalents. Therefore, a programmed computer is statutory, but this claim still raises the 35 USC 101 issue because there is no physical data transformation which creates a useful, concrete, and tangible result. It is suggested to positively recite the statement “display at spatially offset positions to generate the appearance of a high resolution image” found in lines 1-2 in the body of the claim instead of just in the preamble of the claim.

This is similarly applied to the independent claim 27, where instead of having an apparatus claim with several means steps, a “computer readable medium having computer-executable instructions” to produce those same several means steps is considered.

Claims 20-26 fail to resolve the deficiencies of claim 19 and claims 28-30 fail to resolve the deficiencies of claim 27, since they still do not provide a practical application

Art Unit: 2621

because there is no physical data transformation that creates a useful, concrete, and tangible result.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Gibbon et al (US 2003/0020809 A1).

Re Claim 1, 10: Gibbon for claim 1 discloses a method of displaying an image with a display device (see paragraph [0001], [0031], lines 1-7), the method comprising of receiving image data on a first type of grid (see paragraphs [0012], [0007], lines 9-10, "high resolution of the source material"); generating a first sub-frame (see Fig. 5, Ref. No. 33, paragraphs [0034], lines) and a second sub-frame (see Fig. 5, Ref. No. 34, paragraphs [0034]) corresponding to the image data, the first and the second sub-frames each generated on a second type of grid that is different than the first type of grid (low resolution or in other words smaller grid size is considered to be a different grid, paragraph [0014], lines 3-4); and

alternating between displaying the first sub-frame in a first position and displaying the second sub-frame in a second position spatially offset from the first position (see Fig. 7, paragraph [0036], [0014], [0035]).

This is similarly applied to claim 10 where instead of a method comprising several steps, a system comprising of a buffer (inherent feature for DMD projection system, RAM), an image processing unit (see [0014], [0033], [0034]), and a display device to produce those same steps respectively is considered. Gibbon teaches all the limitations in the same respective manner as described above for claim 1.

### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 6-7, 15-16, 19, 24, 27, 30, 31, 34, 37, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gibbon in view of Park ("Super-Resolution Image Reconstruction: A Technical Overview"; IEEE Signal Processing Magazine vol 20, pages 21-36, May 2003).

Re Claim 6,15, 19, 27, 31, and 37: Gibbon for claim 19 discloses a system for generating low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image (see paragraphs [0012], lines 12-14, [0014], lines 4-7), the system comprising the means for receiving a first high resolution image on a first type of grid (see paragraphs [0012], [0007], lines 9-10, "high resolution of the source material"); means for generating a first plurality of low resolution sub-frames based on the first high resolution image and the stored relationship, each of the low resolution sub-frames generated on a second type of grid (see Fig. 5, Ref. No. 33-34, paragraph [0034], [0014], lines 3-4, low resolution or in other words smaller grid size is considered to be a different grid, paragraph).

This is similarly applied to claim 27, where instead of a system comprising several means steps, a computer-readable medium having computer-executable instructions for causing a computer to compute those several same means steps respectively is considered. Gibbon teaches all the limitations in the same respective manner as described above for claim 19.

This is similarly applied to claim 31, where instead of a system comprising several means steps, a method to produce those same several means steps respectively is considered. Gibbon teaches all the limitations in the same respective manner as described above for claim 19.

This is similarly applied to claim 37, where instead of a system comprising several means steps, a system comprising of a buffer, an image processing unit,

Art Unit: 2621

and a display device to produce those same steps respectively is considered.

Gibbon teaches all the limitations in the same respective manner as described above for claim 19.

However, Gibbon does not disclose or fairly suggest how the relationship between sub-frame values and high resolution image values correspond, the relationship being based on minimization of an error metric between the high resolution image values and a simulated high resolution image.

Park discloses how the relationship between sub-frame values and high resolution image values correspond, the relationship being based on minimization of an error metric between the high resolution image values and a simulated high resolution image (see page 30, paragraph 2, "Reconstruction results by POCS ...", a simulated high resolution image is considered because the reconstruction results are after several iterations) as recited in claims 6, 15, 19, 27, 31, and 37 respectively.

Therefore, in view of Park, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Gibbon's system by including the step of applying the POCS algorithm in order to solve the restoration problem to estimate the high resolution image (simulated high resolution image).

Re Claim 7, 16, 24, 30, 34, and 40: However, Gibbon does not disclose or fairly suggest how the simulated image is based on a convolution of the first and the second sub-frames with an interpolating filter.

Park discloses the simulated image is based on a convolution of the first and the second sub-frames with an interpolating filter (see page 25, Section: Nonuniform Interpolation Approach, a simulated image is considered because the reconstruction results are after several iterations).

Therefore, in view of Park, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Gibbon's system by incorporating the step of applying the interpolation algorithm in order to go from a low resolution grid onto a high resolution grid (as shown in Fig. 6 of Park) as well as estimate the high resolution image (simulated high resolution image).

11. Claims 8-9, 17-18, 25-26, 35-36, and 41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gibbon as modified by Park as applied to claims 7, 16, 24, 34, and 40 respectively above, and further in view of Nomura et al (US 6,990,249 B2) and Tanaka et al (JP 54136135 A). The teachings of Gibbon modified by Park have been discussed above.

However, Gibbon modified by Park does not disclose or fairly suggest the interpolation filter includes five filter coefficients, four coefficients of which are

Art Unit: 2621

one-eighth and one coefficient which is one-half, or four coefficients of which are one-half and one coefficient which is one.

Nomura discloses that the interpolation filter includes five filter coefficients (see Fig. 18a, general spatial filter divided by a constant Const), four coefficients of which are one-eighth and one coefficient which is one-half (see Fig. 18a, consider  $\beta = 1/8, \alpha = 1/2, \gamma = 0$ ), or four coefficients of which are one-half and one coefficient which is one (see Fig. 18a, consider  $\beta = 1/2, \alpha = 1, \gamma = 0$ ), as recited in claims 8-9, 17-18, 25-26, 35-36, and 41-42 respectively.

Tanaka specifically discloses the interpolation filter with five filter coefficients, four coefficients of which are one-eighth and one coefficient which is one-half (see Fig. 3) as recited in claims 9, 18, and 26 respectively.

Therefore, in view of Nomura and Tanaka, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Gibbon's system, as modified by Park by including the specific five coefficient interpolation filter in order to interpolate one image to another without introducing much noise which could deteriorate the detailed information.

12. Claims 2-5, 11-14, 20-23, 28-29, 32-33, and 38-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gibbon as modified by Park as applied to claims 1, 10, 19, 27, 31, and 37 above, and further in view of Messing et al (US 6,466,618 B1). The teachings of Gibbon modified by Park have been discussed above.

However, Gibbon as modified by Park does not disclose or fairly suggest the first type of grid is a rectangular grid and the second type of grid is a diamond grid; that the image data includes rectangular-shaped pixels on the rectangular grid and the first and second sub-frames each include diamond-shaped pixels on the diamond grid; that the first type of grid is a diamond grid and the second type of grid is a rectangular grid; that the image data includes diamond-shaped pixels on the diamond grid and the first and the second sub-frames each include rectangular-shaped pixels on the rectangular grid.

Messing discloses that the that the first type of grid is a rectangular grid (see Fig. 7, see col. 6, lines 23-35, the three color fields, blue, red, and green are coincidently transformed to the blue rectangular field or regular grid) and the second type of grid is a diamond grid (col. 7, lines 48-54, irregular grid is considered to be the diamond grid); that the image data includes rectangular-shaped pixels on the rectangular grid (since this grid is rectangular as just mentioned above, the pixel shapes are inherently known to be rectangular) and the first and second sub-frames each include diamond-shaped pixels on the diamond grid (since this grid is diamond as just mentioned above, the pixel shapes are inherently known to be diamond); that the first type of grid is a diamond grid (see Fig. 7, Ref. No. 78, see col. 6, lines 23-35, the consideration is that the three color fields, blue, red, and green are coincidently transformed to the green diamond field or irregular grid instead of the blue rectangular or regular grid) and the second type of grid is a rectangular grid (col. 7, lines 48-54, regular

grid is considered to be the rectangular grid); that the image data includes diamond-shaped pixels on the diamond grid (since this grid is diamond as just mentioned above, the pixel shapes are inherently known to be diamond) and the first and the second sub-frames each include rectangular-shaped pixels on the rectangular grid (since this grid is rectangular as just mentioned above, the pixel shapes are inherently known to be rectangular); as recited in claims 2-5, 11-14, 20-23, 28-29, 32-33, and 38-39 respectively.

Therefore, in view of Messing, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Gibbon's system, as modified by Park by applying the specific grids on each of the different images in order to enhance the final observed image resolution.

### ***Conclusion***

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Phan discloses displays using spatial elements; Cole et al discloses an image display system and method including optical scaling; Allen et al discloses an image display system; William Allen discloses an image display system; Patti et al discloses a system for creating a high resolution image from a sequence of lower resolution motion images; Vuolo et al discloses a high resolution television projection system; Patti discloses a super resolution video reconstruction with arbitrary sampling lattices.


Art Unit: 2621

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard Krasnic whose telephone number is (571) 270-1357. The examiner can normally be reached on Mon-Thur 7:30am-5:00pm and every other Friday 7:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jong-Suk (James) Lee can be reached on (571) 272-7044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Bernard Krasnic  
October 25, 2006



JONG SUK LEE  
SUPERVISORY PATENT EXAMINER